Seamless V&V: Concept Validation

Kristina Carr
Concept Development & Validation Group
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Concept Documents

- **Concept of Operations** *(IEEE Standard 1362-1998)*
  - An operationally oriented description of user’s needs, including qualitative and quantitative characteristics, that communicates how the system is expected to operate in its environment.

- **Service or Sub-Service Level Concept of Operations** *(NAS SEM)*
  - More insight, detail, in-depth information
  - Elaborates on capabilities and use

- **Concept of Use** *(NAS SEM)*
  - Extension of the ConOps, more detail, more elaboration
  - Narrative describing functional characteristics
Concept Development and Validation Process

ATS CD&V Group
Concept and Requirements Development and Validation

- JPDO Concept of Operations for NextGen
  - Mid-Term
  - End to End ConOps
  - Develops
  - 2nd Level Concepts

- End State
- End to End ConOps
- Develops
- 2nd Level Concepts

Concept Validation and Refinement Activities

- Analysis of related
  (higher/lower level) CONOPS
- Analysis of EA
- Stakeholder feedback
- Cognitive Walkthroughs
- Part Task Studies
- Fast Time Simulations
- HITL’s
- Field Testing

Feedback from Service Units

Service Units
Concept and Requirements
Refinement and Implementation

- NextGen Implementation Plan
  - Operational Capabilities
  - NextGen
  - End State Operational Improvements
  - Non-FAA Sources
  - AIR
  - AFS
  - ATO-R
  - ATO-T
  - ATO-E
  - ATO-W
  - Non-FAA Sources

Feedback from Service Units

ATC CD&V Group
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Feedback from Service Units

Federal Aviation Administration
To determine a common strategy for validating and verifying the performance, reliability, and safety of ATM systems. The strategies provide guidance for validation and verification of operational concepts during R&D phases of ATM sub-system development.
Action Plan 5: Validation & Verification Strategies

**Concept Validation**

is an iterative process by which the fitness-for-purpose of an operational concept being developed is established.

**Verification**

“correctness and consistency”

is the action of demonstrating or proving to be true or legitimate by means of evidence or testimony (OCVSD 2008).

**Validation**

an iterative process by which the fitness-for-purpose of an operational concept being developed is established (OCVSD 2008).

“confidence in the ability to operate in real-life environment against a pre-defined level of functionality, operability, and performance”

Feedback to decision makers and concept developers
1. Mission Need Decision: Gather and assess ATM operational needs.
2. Investment Analysis Readiness Decision: Scope operational concept & develop validation strategy & plan(s).
4. Final Investment Decision: Integration, Build, consolidate, & test.
5. In-Service Decision: Pre-operational, Industrialisation & Approval, Operational, Implementation.

NEW SERVICE NEEDS

MISSION
Analysis

ANALYSIS

INVESTMENT
Initial Analysis

Final Analysis

SOLUTION IMPLEMENTATION

Mods & New Capabilities

IN SERVICE MANAGEMENT

Federal Aviation Administration
NAS SEM – V&V is the System Engineering process that confirms that the system requirements are

Correct → validation

and

Satisfied → verification
Perspectives on V&V

T&E V&V Handbook

“The purpose of Verification is to ensure that selected work products meet their specified requirements.”

“The purpose of Validation is to demonstrate that a product of product component fulfills its intended use when placed in its intended environment.”

Are we building the right system?

Are we building the system right?
V&V: Big Picture

1. Mission Need Decision
2. Investment Analysis Readiness Decision
3. Initial Investment Decision
4. Final Investment Decision
5. In-Service Decision

NEW SERVICE NEEDS

MISSION ANALYSIS

INVESTMENT ANALYSIS

SOLUTION IMPLEMENTATION

IN SERVICE MANAGEMENT

SERVICE

Analysis

Concepts & Req. Definition

Initial IA

Final IA

Full Scale Development

Mods & New Capabilities

NextGen CONOPS

V&V

2nd Level CONOPS

Requirements

Prototype

Dev System

Operational System

V1

V2

V3

V4

V5

Operational Concept Validation (CD&V)

Verification (T&E)
Questions/Comments